

CLAIMS

1. A high power laser source for generating a stable exit beam at a given wavelength, said laser source comprising a laser diode and guide means for  
5 conducting a laser beam, said laser diode including a reflecting front facet and said guide means including at least one reflector, *wherein*
- said reflector has a reflectivity  $R_{\text{FBG}}$ , centered at the desired wavelength of said exit beam,
  - said front facet has a reflectivity  $R_{\text{F}}$  towards said guide means,
  - 10 - said reflectivities  $R_{\text{FBG}}$  and  $R_{\text{F}}$  being selected to achieve a predetermined relative feedback
- $$r_{\text{FB}} = k * R_{\text{FBG}} / R_{\text{F}} > 1,$$
- $k$  being a factor determined by the coupling efficiency within said guide means.
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2. The laser source according to claim 1, *wherein*
- the relative feedback  $r_{\text{FB}}$  is between 5 and 10.
3. The laser source according to claim 1, *wherein*
- 20 - the laser source is uncooled.
4. The laser source according to claim 1, *wherein*
- the reflectivity  $R_{\text{F}}$  of the laser's front facet towards the guide means is less than 10%.
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5. The laser source according to claim 4, *wherein*
- the reflectivity  $R_{\text{F}}$  of the laser's front facet towards the guide means is less than 1%.
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6. The laser source according to claim 1, *wherein*

- the FWHM reflectivity bandwidth of the reflector corresponds to the equivalent of at least 5 longitudinal Fabry-Perot internal modes of the laser diode.

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7. The laser source according to claim 6, *wherein*

- the FWHM reflectivity bandwidth of the reflector corresponds to the equivalent of at least 20 – 40 longitudinal Fabry-Perot internal modes of the laser diode.

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8. The laser source according to claim 1, *wherein*

- the reflector is a grating integrated within the guide means.

9. The laser source according to claim 8, *wherein*

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- the reflector is a fiber Bragg grating within a fiber, the latter forming part of the guide means.

10. The laser source according to claim 1, *wherein*

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- the guide means includes a waveguide consisting of or comprising silicon nitride ( $\text{Si}_3\text{N}_4$ ), silica ( $\text{SiO}_2$ ), or silicon (Si).

11. The laser source according to claim 8, *wherein*

- the grating is an apodized grating.

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12. The laser source according to claim 1, *wherein*

- at least two gratings are provided,  
at least one of them integrated within the guide means.

13. The laser source according to claim 12, *wherein*

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- at least of the provided gratings is a fiber Bragg grating.

14. The laser source according to claim 12, *wherein*
- the two or more gratings have different central wavelengths by design.
15. The laser source according to claim 12, *wherein*
- 5    - the two or more gratings are similar or identical by design, but have different central wavelengths generated by applying mechanical and/or thermal stress.
16. The laser source according to claim 8, *wherein*
- 10   - the grating exhibits a non-uniform reflection characteristic resulting in a predetermined filter function.
17. The laser source according to claim 16, *wherein*
- the preselected filter function has a flat-top shape.
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18. The laser source according to claim 16, *wherein*
- the preselected filter function has a linear shape.
19. The laser source according to claim 16, *wherein*
- 20   - the grating is a chirped grating resulting in a preselected chirped filter function shape.
20. The laser source according to claim 16, *wherein*
- the grating is an apodized grating resulting in a filter function shape with
- 25       suppressed side-band maxima.
21. The laser source according to claim 12, *wherein*
- at least one of the gratings is a chirped and apodized grating resulting in a
- 30       preselected chirped filter function shape with suppressed side-band maxima.

22. The laser source according to claim 1, *wherein*
- an electronic dither is superimposed on an injection current of the laser diode for improving the power stability of the laser exit beam.
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23. The laser source according to claim 1, *wherein*
- the laser is a semiconductor diode laser.
24. The laser source according to claim 23, *wherein*
- 10 - the laser is an InGaAs quantum well diode laser.
25. The laser source according to claim 1, *wherein*
- the laser guide means comprises a polarization-maintaining or a non-polarization-maintaining optical fiber.
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26. The laser source according to claim 1, *wherein*
- the guide means includes means for directing the laser beam into an optical fiber.
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27. The laser source according to claim 25, *wherein*
- the means for directing the laser beam into the optical fiber includes beam collimating or focusing means attached to or integrated into said optical fiber.
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28. A method of making a high power laser source with laser diode and laser beam guide means in front of said laser diode,  
*characterized by*
- manufacturing a front facet on said laser diode with a selected reflectivity  $R_F$  towards said guide means,
- 30 - manufacturing at least one reflector with a selected reflectivity  $R_{FBG}$ ,

- said reflectivities  $R_{\text{FBG}}$  and  $R_{\text{F}}$  being chosen to achieve a predetermined relative feedback

$$r_{\text{FB}} = k * R_{\text{FBG}} / R_{\text{F}} > 1,$$

wherein  $k$  is determined by the coupling efficiency within said guide means.

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29. The method according to claim 28, *whereby*

- the at least one reflector with a selected reflectivity  $R_{\text{FBG}}$  is manufactured within said laser beam guide means.

10 30. The method according to claim 28, *whereby*

- the manufacturing of the reflector is carried out by UV exposure creating said reflector as fiber Bragg grating in an optical fiber constituting part of the laser beam guide means.

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